

926.886

PATENT SPECIFICATION

DRAWINGS ATTACHED

926.886



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COMPLETE SPECIFICATION

Improvements in Variable Speed Pulleys and Pulley Drives

We, CROFTS (ENGINEERS) LIMITED, of Empire Works, Thornbury, Bradford, in the County of York, a British Company, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to variable speed pulleys for V-belt drives of the type employing the principle of expanding and contracting so-called cone-faced discs which combined form a V-groove pulley of variable pitch diameter. Infinite speed variation is obtained with this construction within the limits of the maximum and minimum pitch circle diameters by causing lateral movement of at least one of the pulley discs.

Various types of variable speed pulleys have been constructed and often spring-loading is included in one of the pulley units of a variable speed pulley drive for allowing the expansion and contraction in the pulley. It is also known to provide complementary screwed members, or relatively slidable members, with a manual adjusting member, such as a hand wheel. Such adjusting means sometimes forms part of the pulley unit or an associated mounting.

According to the present invention there is provided a variable speed pulley unit, including a pair of pulley discs mounted for one disc to be axially movable in relation to the other and to be rotatably driven thereby, a common driving sleeve for mounting the unit on a driving shaft, said axially movable disc having a sleeve, an axially disposed and axially removable non-rotatable element connected through a free running bearing to said disc sleeve, a pivoted lever having one end connected to said element and the other end connected by a nut to a screw, and means for rotating this screw to provide positive axial adjustment of the movable pulley disc.

[Price 4s. 6d.]

The improved arrangement may include two adjustable stop means disposed at a right angle to one another and in relation to the pivoted lever. The control means may be in a housing forming part of the pulley unit.

The operating means may be a rotary manual device carried by the unit housing.

Alternatively the operating means may be a flexible shaft geared to means adapted to control the position of the pulley unit in relation to another pulley unit in a variable speed belt pulley drive.

The invention will now be more particularly described with reference to the accompanying drawings, in which:—

Fig. 1 is a composite plan view of an electric motor with a pulley unit on a common adjustable base, the movable pulley disc being shown in two positions;

Fig. 2 is an enlarged sectional plan view of the pulley unit; and

Fig. 3 is a composite sectional elevation illustrating a modified pulley unit with a centrifugal multi-disc clutch.

In a particular embodiment of this invention shown in Figs. 1 and 2, a variable speed V-belt pulley unit is constructed for mounting on the shaft 2 of an electric motor 3, or other driving shaft, and includes two cone-faced discs 4 and 5 of which the disc 4 is fixed to the shaft 2 and furnished with an axial sleeve part 6 on which the other disc 5 is slidably mounted and keyed thereto to be rotatable with the first disc. The second pulley disc 5 also has a sleeve 7 of a length to extend beyond the first disc sleeve and a ball bearing 8 is mounted within this second sleeve and retained by a displaceable end cap 9. Mounted within the outer end of the sleeve 7 and retained within the ball bearing 8 is a stepped collar 10 which projects out through the bearing retaining cap 9 a predetermined distance and is furnished with an enlarged slotted head 11.

To operate the above slidable pulley disc there is mounted a double-ended pivoted lever 12 having both ends 13, 14 bifurcated and the end 13, which is the longer of the two, is connected by a through pin 15 (or other means) to the slotted head 11 of the collar 10 so that when the lever 12 is rocked about its pivot 16 it will give axial movement to the collar 10 and thus the movable pulley disc 5 to which the collar is anchored. This lever is mounted by its pivot pin 16 within a housing 17 which surrounds this end of the pulley unit, said housing being secured by means of a bracket 18 to part of a base 19 or other mounting for the pulley unit and its driving means. To control the movements of the lever 12 and thus the pulley disc 5 the other end of the lever is furnished with a nut 20 pivoted between its jaws and this is mounted on a screw 21 having a spindle 22 rotatably mounted in one wall of the housing 17.

The above operating screw 21 can be operated in different ways. For example, the outer end of the screw can be furnished with a hand wheel 23, as indicated in Fig. 3, rotatably anchored on the outside of the housing 17 for direct manual control of the movable disc 5, and indicator means may be furnished for facilitating the setting of the disc for a given speed required in a belt pulley drive. Alternatively, as shown in Figs. 1 and 2, the end of the screw spindle 22 is connected to a flexible shaft 24 having its other end geared by bevel gears 25 to a shaft 26 furnished with a hand wheel 27 and used in known manner for moving the electric motor 3 (or other driving means) and base 19 on guides 28 on a fixed base 29. Such guides are usually angled to maintain belt alignment. With this arrangement operation of the common hand wheel 27 moves the motor 3, driving shaft 2 and pulley unit in relation to another shaft in the belt drive and simultaneously gives the required relative movement between the pulley discs 4, 5 in the pulley unit to maintain correct alignment and belt tension in the drive at all speed conditions.

Adjustable stop means are furnished for the pivoted lever 12 and such means comprise a pair of set screws 30, 31 mounted at right-angles to one another in the walls of the housing 17 so that the pivotal movement of the lever can be limited in both directions.

In some instances it is desirable to smooth out the pick-up between the driving shaft 2, e.g., the electric motor shaft, and the pulley unit and in this case a clutch can be interposed between such driving shaft 2 and the pulley disc 4 that is normally fixed upon the shaft. Our co-pending Patent Application No. 2399/60 (Serial No. 926,887) filed 22nd January, 1960 discloses an inter-

posed similar clutch. As shown in Fig. 3 the pulley disc 4 is fitted with bearing bushes 32 and is rotatably mounted on the shaft 2 and secured to the outer part 33 of a clutch, the other clutch part 34 being keyed or otherwise secured to the shaft 2. Various types of clutches may be used for this purpose and it has been found that a centrifugal multi-disc clutch of the type disclosed in the Specification of our Patent Serial No. 886,255 is eminently suitable for this purpose with slight modifications to adapt it for securement to the pulley disc 4.

The multi-clutch has the inner clutch part 34 in driving connection with the outer clutch part 33 through driving and driven discs 35, 36, which engage teeth in known manner. A back plate 37 is provided on one side of the discs engaging a retained collar 38 and on the other side of the disc there is a pressure plate 39 having its other face inclined to be engaged by a set of centrifugal weights 40. These weights 40 are guided radially by projections 41 which are integral with a pressure reaction plate 42 which is retained on the clutch part 34. The projections 41, integral with the reaction plate, form what is termed a spider in the previous Patent Specification and as therein stated such spider may be a separate part secured to the clutch part 34. The weights are held within the spider by garter springs 43, although as stated in the prior Specification coil springs may be used for the various weights. By providing a clutch, particularly a clutch of the type shown, between the pulley unit and the driving force, the clutch will smooth out the pick-up of the drive when the motor is switched "direct on line." Where there is a direct drive from an electric motor to a pulley unit there is a tendency for the jerk on the belt, when starting against load, to be detrimental to the life of the belt. Also this jerk would tend to pull the belt down the discs 4, 5 on the driven shaft and there is a possibility of the belt breaking. Thus the use of the clutch as shown permits a variable speed motor gear to be used for applications where otherwise such a drive might not be suitable.

With this arrangement the pulley unit has further housing means 44, having an opening for the passage of the belt, bolted to the end flange 45 of a driving motor to secure the first-named housing 17. Also both pulley discs 4 and 5 are furnished with external vanes 46. This arrangement of securing the pulley unit to the motor by means of housing 44 is alternative to the other arrangement shown in Figs. 1 and 2 but it will be appreciated that the base mounting arrangement may be used when a clutch is incorporated. Also, the shown clutch arrangement (Fig. 3) has the lever 12 controlled by a handwheel 23 but some other operating

means, such as a flexible shaft 24 may be employed.

WHAT WE CLAIM IS:—

1. A variable speed pulley unit, including
5 a pair of pulley discs mounted for one disc to be axially movable in relation to the other and to be rotatably driven thereby, a common driving sleeve for mounting the unit on a driving shaft, said axially movable disc
10 having a sleeve, an axially disposed and axially movable non-rotatable element connected through a free running bearing to said disc sleeve, a pivoted lever having one end connected to said element and the other end connected by a nut to a screw, and
15 means for rotating this screw to provide positive axial adjustment of the movable pulley disc.
2. Variable speed pulley unit according
20 to claim 1, wherein two adjustable stop means are disposed at a right angle to one another and in relation to the pivoted lever.
3. Variable speed pulley unit according
25 to claim 1 or 2, wherein one end of the pivoted lever is connected to a non-rotatable collar mounted through a ball bearing within the sleeve of the movable pulley disc.
4. Variable speed pulley unit according
30 to claim 1, wherein one end of the pivoted lever is bifurcated to receive a nut through a pivotal connection, said nut being mounted on the screw-threaded end of an operating spindle rotatably mounted in one wall of a housing for the pulley unit.
- 35 5. Variable speed pulley unit according to any of the preceding claims, wherein the operating screw is controlled by a rotary manual device such as a handwheel mounted externally of a housing enclosing at least
40 part of the pulley unit.
6. Variable speed pulley unit according to any of the preceding claims 1 to 4, wherein the operating screw is controlled by a

flexible shaft geared to means adapted to control the position of this pulley unit in relation to another pulley unit in a variable speed belt pulley drive. 45

7. Variable speed pulley unit according to any of the preceding claims, characterised in that the unit has an associated clutch interposed between it and the driving shaft. 50

8. Variable speed pulley unit according to claim 7, wherein the clutch is of a centrifugal multi-disc type.

9. Variable speed pulley unit according to any of the preceding claims, wherein the pulley unit, having a housing, has such housing secured to a flanged electric motor by means of a housing which surrounds the pulley unit belt discs with a passage opening for the belt drive. 55 60

10. Variable speed pulley unit according to any of the preceding claims 1 to 8, wherein the pulley unit, having a housing, has such housing secured to a base to which the driving means, such as an electric motor, is also secured. 65

11. Variable speed pulley unit according to claims 6 and 10, wherein the flexible shaft is geared to a manually-operated shaft which is adapted to move the mounting base for the driving means and pulley unit for drive adjustment purposes. 70

12. Variable speed pulley unit substantially as described with reference to figures 1 and 2, or 3, of the accompanying drawings. 75

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FIG. 1

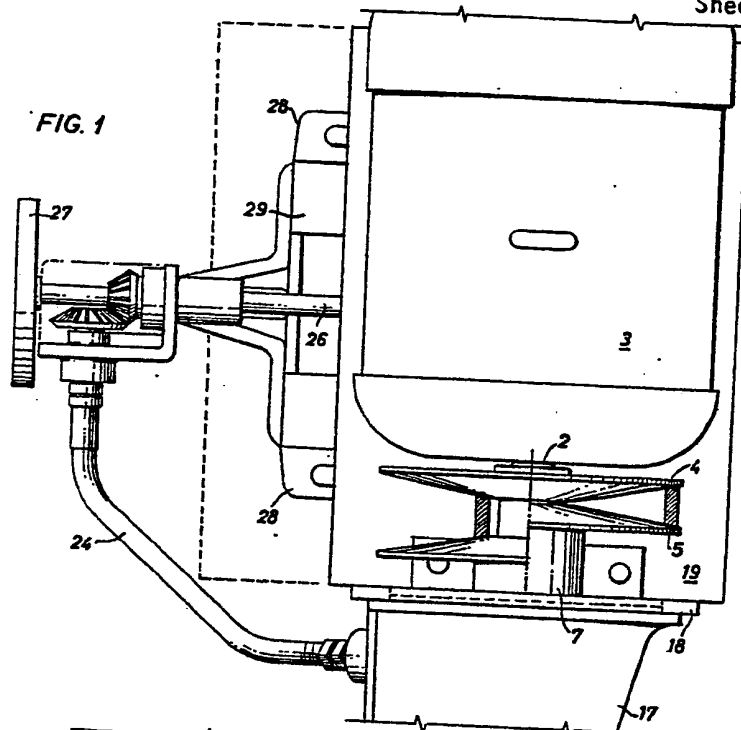


FIG. 2

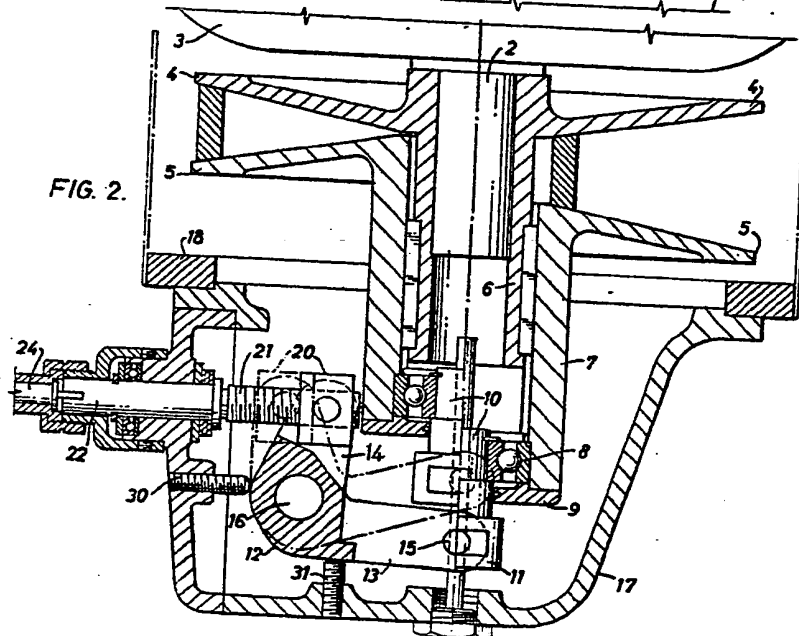
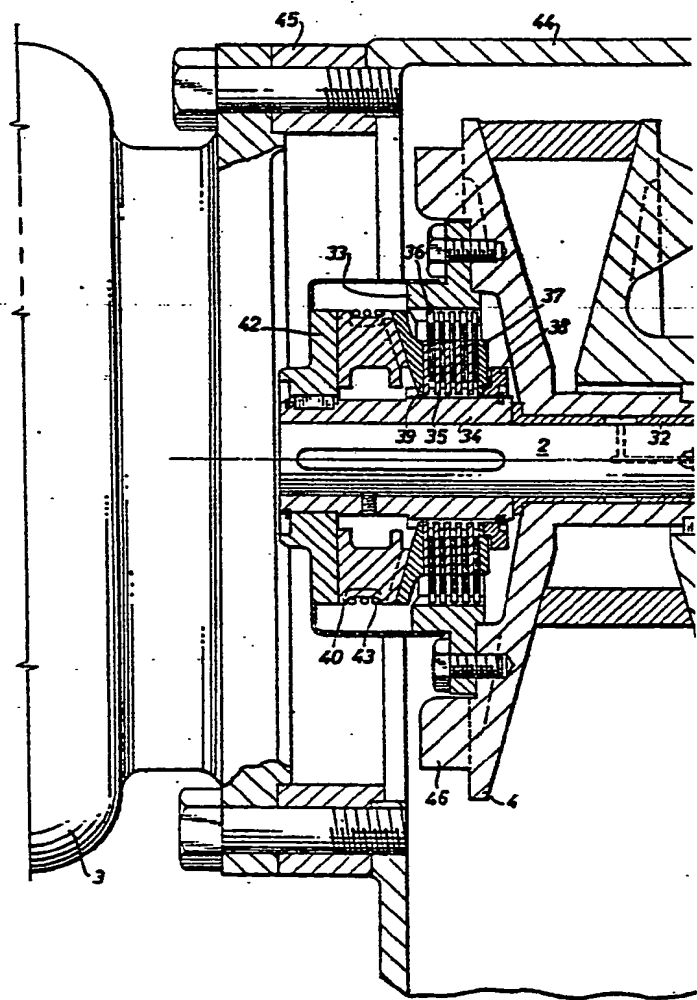


FIG. 3.

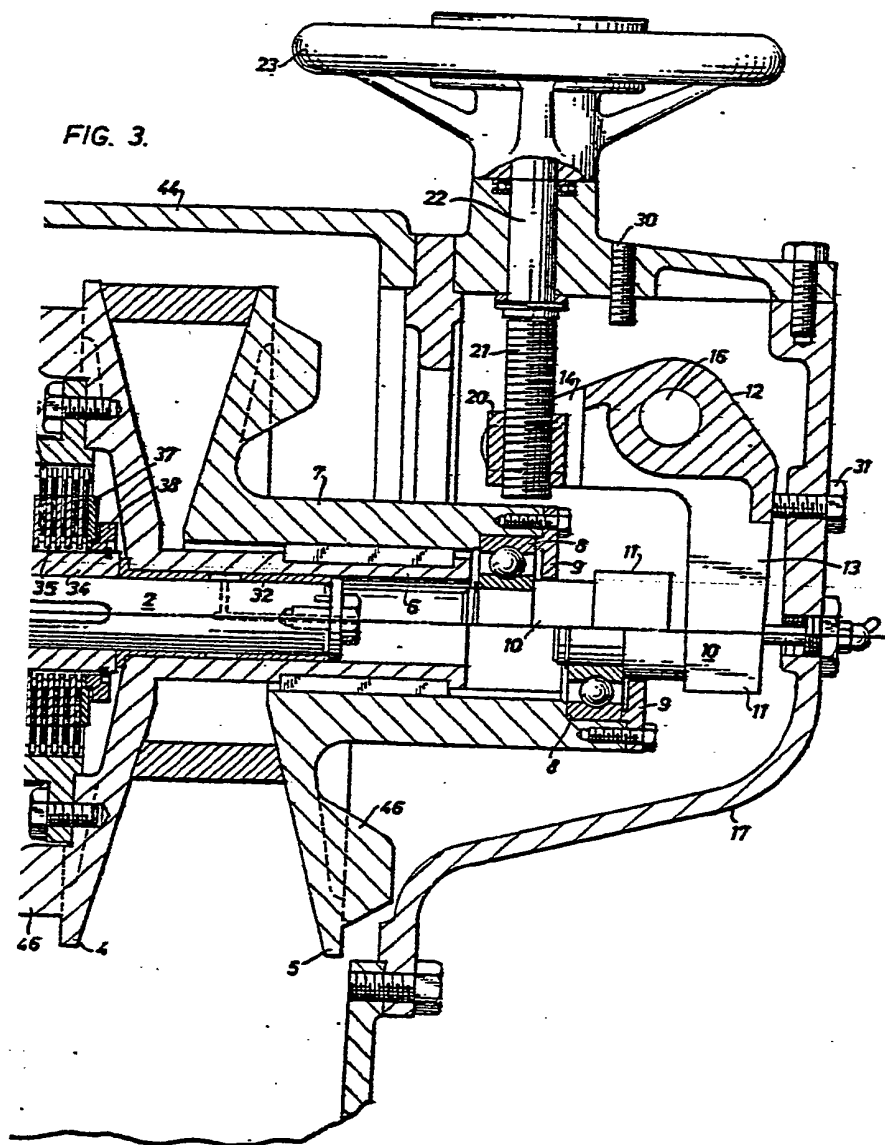


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COMPLETE SPECIFICATION

2 SHEETS

This drawing is a reproduction of
the Original on a reduced scale
Sheet 2



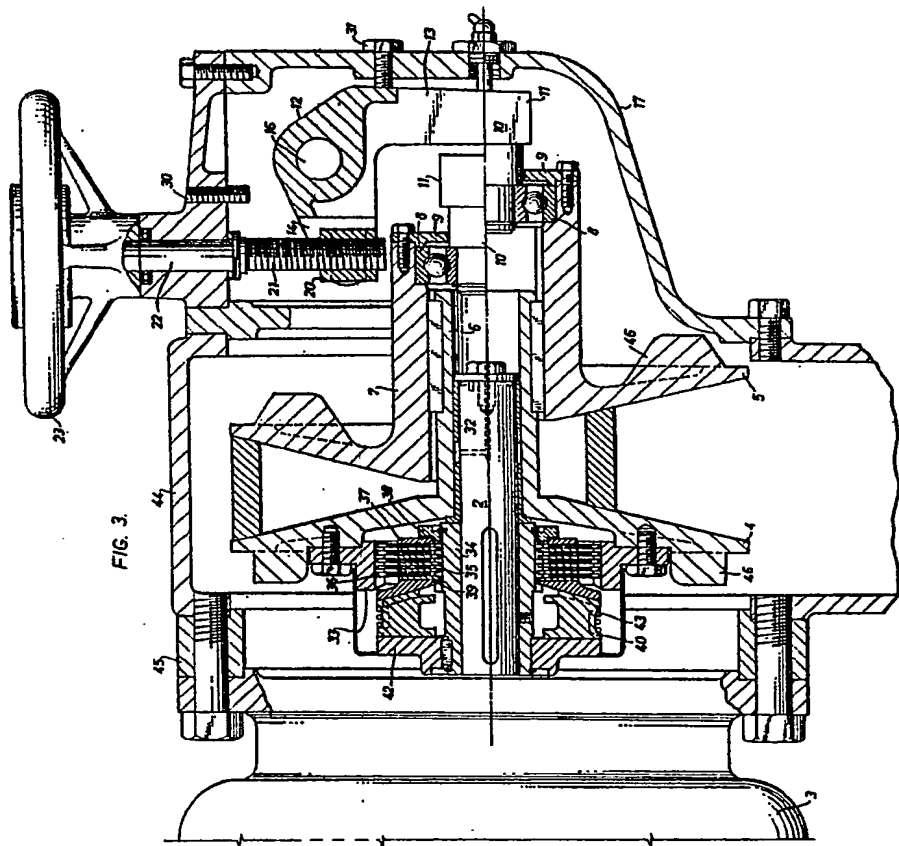


FIG. 3.

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